

Challenges in MRAM Down Size Scaling

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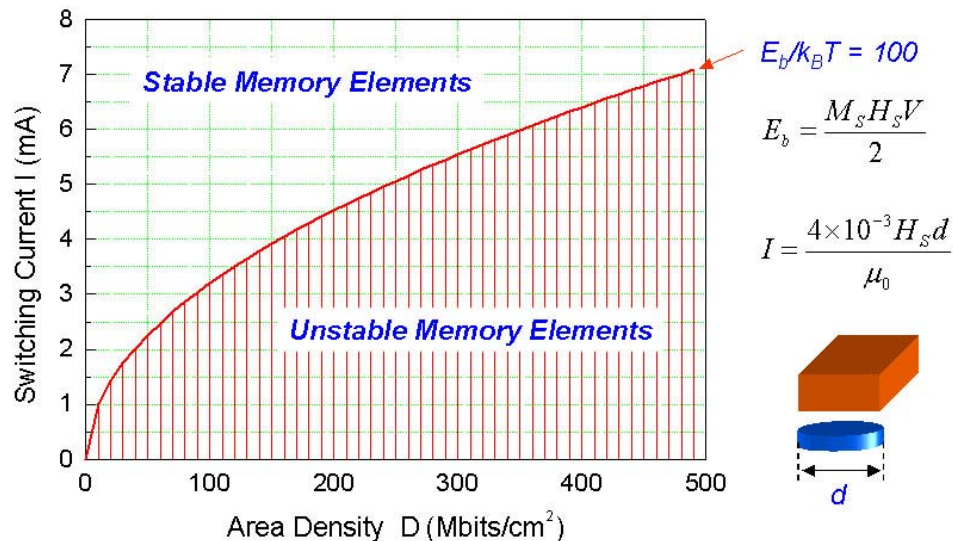
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Magnetic Random Access Memory (MRAM) has the potential to replace all today's computer memory because its speed, compatible with CMOS technology, and, most importantly, the non-volatility. MRAM's radiation hardness property is also specially advantageous for space applications. Today, many companies are developing MRAM products for replacing SRAM, DRAM, and FLASH and a universal memory device is on the horizon. In this talk, the physical and technological challenges for MRAM down size scaling will be discussed. As the memory elements get smaller, the memory state can be altered undesirably by thermal agitation. In consequence, the write threshold needs to be raised as the size of each memory cell reduces. Figure 1 shows the write current threshold as a function of area storage density. It is concluded the power consumption of a given chip increases linearly with area storage density. Various potential solutions to this problem will also be reviewed.



□ A memory element needs to have sufficiently large switching current threshold to resist thermally activated state reversal.

Fig. 1, Calculated write current threshold as a function of area storage density.